REMARKS

Formal Matters:

Claims 1-19 were examined and rejected.

By this Amendment, claim 6 has been amended to address the rejection under 35 U.S.C. §112, second paragraph, discussed below. Accordingly, no new matter has been added.

Claims 1-19 remain pending in the application.

Rejections Under §112, 2nd ¶

Claim 6 was rejected under 35 U.S.C. §112, second paragraph, as being indefinite due to its dependency on claim 7. Claim 6 has been amended to depend from claim 1. Withdrawal of this rejection is respectfully requested.

Rejections Under §103

Claims 1-19 were rejected under 35 U.S.C. §103(a) as being unpatentable over Ivanovic et al. ("Monte Carlo Simulation Study of Multi-Window Imaging") in view of Woods et al. ("MRI-PET Registration with Automated Algorithm").

Ivanovic et al. are concerned with dual isotope imaging. That is to say, they are concerned with imaging simultaneously using two different tracers. Although the paper mentions briefly in the abstract and introduction that "this would allow simultaneous emission and transmission imaging", the remainder of the paper is actually concerned with evaluating the feasibility of dual-radio nuclide imaging and it does not disclose, teach or suggest how this allows simultaneous emission and transmission imaging. In fact the paper does not disclose the step of simultaneous emission and transmission imaging at all. The paper simply indicates that if dual radio nuclide imaging is feasible (and Applicant notes that the conclusion on page 1304, right hand column, lines 1-3 is very cautious), then transmission and emission imaging simultaneously would be a potential possibility.

Comparing the disclosure of Ivanovic et al. with the elements of claim 1, it lacks any teaching or suggestion of taking a second image of the subject by an imaging process of a second modality (because it does not actually disclose simultaneous emission and transmission imaging - just the potential possibility of doing so if dual radio nuclide imaging is a success). Additionally, Ivanovic et al. do not disclose distinguishing between one area of interest and at least one other area not of interest in a second image (not least because it does not disclose taking a second image). Furthermore, Ivanovic et al. do not

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disclose identifying the at least one area of interest and another area not of interest in the first image on the basis of the known positional relationship or, in other words, segmenting the first image on the basis of segmentation in the second image. Applicant also notes that Figure 1 of Ivanovic et al. is a diagram showing the design of the brain phantoms used in the simulation study. Consequently, Figure 1 does not disclose any form of segmentation of an image, i.e., of identifying an area of interest and an area not of interest. In sum, Ivanovic et al. do not have two images and so cannot possibly disclose segmenting one on the basis of the other. Further, as the Examiner has pointed out, Ivanovic et al. does not teach details of a third image at all.

As the Examiner has pointed out with respect to the claimed invention, processing is first performed between the first and the second image (namely in practice the first image is segmented (i.e., areas of interest and not of interest are distinguished) on the basis of the segmentation in the second image, and then a second processing is performed between the first and third images. In practice the first image, which has already been segmented (on the basis of the second image), is registered to the third image. To give an example, the registration step between the PET image (first image) and MRI image (third image) is performed after the PET image has already been segmented on the basis of the transmission image (second image). Accordingly, a key aspect of the claimed invention is involves that which occurs prior to registration of the PET and MRI images. Registrations thereafter may use any appropriate registration technique.

Ivanovic et al. do not disclose, suggest or teach the claimed steps prior to the registration step. These steps are also not present nor suggested in Woods et al. Woods et al. disclose registering two images of different modalities (for example, PET and MRI). In this respect, Woods et al. have a similar objective as the present invention, however, they do not achieve such objective by means of the claimed method, i.e., namely by an initial segmentation of the first (e.g., PET) image on the basis of the second (e.g., transmission) image. In Woods et al., the MRI and PET images are registered by trying to match areas of uniformity in each of the images. Woods et al. achieve this by partitioning the MRI image into 256 separate areas, each area having a uniform value of MR intensity. The algorithm then attempts to align the PET image with the MRI image so that areas which are also uniform in the PET image correspond to the uniform areas in the MRI image. This is explained at page 537, left-hand paragraph, lines 47 to 56 which state:

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"The second modification is that the algorithm partitions the MR image into 256 separate components based on the value of the MR pixels. The algorithm then seeks to maximise the uniformity of the PET pixel values within each of these partitions. The idealised assumption here is that all pixels with a particular MR pixel value represent the same tissue type so that the values of corresponding PET pixels should also be similar to each other."

Thus, Woods et al. do not disclose that either the PET scan or the MRI scan is first segmented on the basis of another image having a known positional relationship with it.

Woods et al. do disclose that the MR images are edited to exclude non-brain structures prior to registration, but this is performed manually. This is clear from page 537, right-hand column, lines 26-29 which state:

"1. Prior to using the algorithm, the MR image is manually edited to remove the scalp, skull and meninges so that only brain structures are present in the MR image set."

In fact it is interesting to note here that Woods et al. do disclose (at page 539, right-hand column, lines 5 to 9) the conventional technique of using a transmission image for attenuation correction of the PET image; however, this transmission image is not used for anything else. It is used simply in the conventional way for attenuation correction. In fact, Woods et al. disclose using fiducial markers to validate the alignment of the PET and MRI scans, which makes it clear that Woods et al. had no intention or appreciation of using the transmission image to improve the registration process, as defined in claim 1.

Thus, the combination of Woods et al. and Ivanovic et al. does not disclose, suggest or teach using the segmentation of the second image of the subject to segment the first image. For at least this reason, the invention as defined in claim 1 is not obvious from the combination of Woods et al. and Ivanovic et al. As claims 2-19 are dependent on or have a chain of dependency on claim 1, the subject matter there of is also not obvious from this combination of reference.
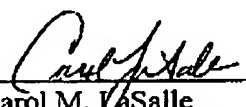
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CONCLUSION

Applicant submits that all of the claims are in condition for allowance, which action is requested. If the Examiner finds that a telephone conference would expedite the prosecution of this application, please telephone the undersigned at the number provided.

The Commissioner is hereby authorized to charge any underpayment of fees associated with this communication, including any necessary fees for extensions of time, or credit any overpayment to Deposit Account No. 50-0815, order number KEMP-009.

Respectfully submitted,
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